

Activity #7: Math: Quadratic Equation Model (Student version)
(Graphing calculator)

Note to students: Teams of two or three students are required for this activity. Your work and answers are to be made in the provided answer spaces (use additional paper if needed) with the required graphs attached and labeled.

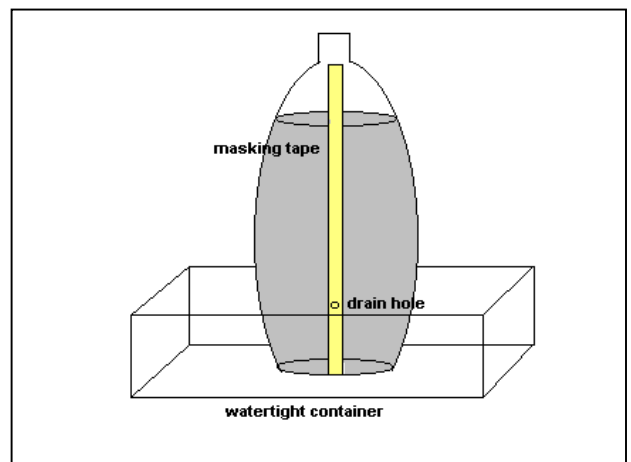
This activity is an extension of the activity in Advanced Algebra, Chapter 5, Prentice Hall ©1998.

Purpose: To understand better the quadratic equation
 To recognize a possible quadratic curve
 To generate the equation from data collected using technology
 To recognize phenomena that might generate these curves

Materials: TI graphing calculator, computer, TI-Graph Link, large plastic soda bottle, masking tape, metric ruler, stopwatch, funnel, water, large bowls

Equipment Setup:

1. Attach a piece of masking tape from the bottom to the top of the soda bottle as shown.
2. Make a small hole in the bottle through the masking tape about 5cm from the bottom of the bottle.
3. Put a piece of masking tape over this hole.
4. Place the bottle in the bowl.
5. Fill the bottle with water as shown.
6. Mark this water height on the masking tape.



Experiment Procedure:

You will be recording water height every 5 seconds (10 seconds or other suitable interval, depending on the size of the drain hole) by marking the water height on the masking tape. When ready to begin, pull the masking tape from the hole and begin the timing. After 5 seconds, one team member will signal the end of that time interval and the other member will mark the water height on the masking tape. Continue until the water height reaches zero (the level of the drain hole). Remove the tape and measure the water height at each 5-second interval. Complete the table. Extend the table, if necessary.

time (s)	0									
water height (mm)										

Data Analysis:

1. Enter the time values in List1 and the water level values in List2 on your calculator.
2. Do a StatPlot using these two lists and printout your graph.
3. Decide which family(ies) of functions might be used to model the data you collected.
4. Perform a quadratic regression using List1 and List2.
5. Enter this equation as function y_1 and graph. Printout your graph and your function y_1 .
6. Write a paragraph describing this experiment and what you learned about modeling real world phenomena. What does the data and the mathematical model you found tell you about the rate at which the water flows from the bottle? Is it constant or does it change and if it changes, how?

Extension:

If you think another function might better model the data, repeat steps 4 and 5 using that regression. Printout this new model and tell why you feel it better models the data. How do these two models relate? Hint: Notice the domain values!
